

University of Sopron

Faculty of Forestry

PhD Thesis

Hungarian private forest owners and properties

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## **Introduction and aims**

The private forest management is an important part of the Hungarian forestry sector. The forests which got into private ownership during the privatisation in the 1990's or established on private land later give 44% of Hungarian forest land and 36% of domestic wood production. The private sector today still has some operational difficulties, causing the accumulation of unutilized potential yields.

Today our knowledge about Hungarian private forest owners and the property structure of the sector is still incomplete. The main aim of the dissertation is to provide information, which can help to understand the main processes and difficulties of the sector, by analysing a database created by joining databases from the national forestry register and the cadastral register using geoinformatic methods.

The aim of the thesis is to answer the following questions:

1. How accurately is it possible to join the forestry register and the cadastral register, and at which scale is it applicable to get information of the sector?
2. How unequal is the property structure of the private forest compared to the private forest sector of other countries and other sectors of economy?
3. How common is the fragmented or geographically dispersed property in the private forest sector?

4. What is the measure of forest land circulation among owners, and what affect does it have on the property structure?
5. How are the number of the owners and the distribution of their properties according to the area changing?

## **Material and methods**

The basic data for the dissertation was provided by the National Food Chain Safety Office (NÉBIH) and Institute of Geodesy Cartography and Remote Sensing (FÖMI) in the form of two databases consisting of altogether 6 data tables (*Figure 1*).

The join of the base units of the two registers was accomplished by NÉBIH by geoinformatic methods. The author got the information of the overlapping of the two registers in the form of a data table (“Joiner” table). The correction and analysis of the database was done using the “R studio” software.

The author had to check the data in both of the data table from FÖMI and in the “Joiner” table, and restructure the afforestation table. Some of the data was missing, or in different forms, the “Joiner” table contained duplicates and records of false overlapping caused by the differences of the maps of the two registers. The corrections and filtering were done based on criteria set by legislative rules or observable systematic patterns of the database.

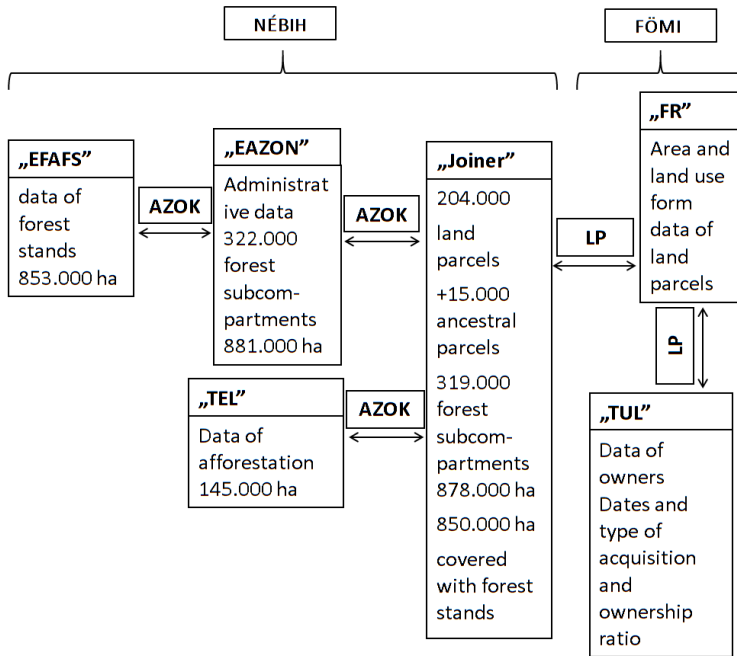


Figure 1: Entity-relationship model of the database

To measure the inequality of the property structure the author applied the Gini index, which also makes it possible to compare the inequality of the Hungarian private forest sector with other sectors.

In several cases the land parcel polygons of the cadastral register and the forest subcompartment polygons overlap and create a system of several overlapping objects. The author names these structures “land parcel-forest subcompartment complexes” (complex for short). This phenomenon is relevant because of the legislative environment. In Hungary according

to the Forest Act all the owners of all the land parcels within a complex must manage the forest area of the complex together, or if they intend to do otherwise, they have to make an agreement first.

The author used an index to measure the geographic concentration of the forest properties of owners, which is similar to the Weighted Standard Distance index commonly used in special analysis for point like objects. The author calls this index the Geographic Concentration of Property (GCP) which gives the radius of a circle in kilometres, which centre is the centre of gravity of the property, and the radius is the average distance of land parcels from the centre of gravity of the property weighed by their area.

$$GCP = \frac{\sum_{i=1}^n \left\{ T_i * \sqrt{\left[ \frac{\sum_{i=1}^n (X_i * T_i)}{\sum_{i=1}^n T_i} - X_i \right]^2 + \left[ \frac{\sum_{i=1}^n (Y_i * T_i)}{\sum_{i=1}^n T_i} - Y_i \right]^2} \right\}}{\sum_{i=1}^n T_i} / 1000,$$

where GCP is the geographic concentration index of the forest properties of an owner,

n is the number of land parcels in the owners' forest property,

X is the X EOV coordinate of the separate parcels,

Y is the Y EOV coordinate of the separate parcels,

T is the area of the forest area of the separate parcels.

## **New scientific results (theses) and conclusions**

1. I revealed that it is possible to join the forest subcompartments on 98.5% of the private forest area with the land parcels of the cadastral register map. On 1.1% of the overlapping area the join is unsure and on 0.39% NÉBIH did not have cadastral data about the forest land. The forest subcompartments lying on more than one land parcel give the 13.1% of the private forest area.

As a conclusion, the two databases are well joinable with geoinformatic methods. The proportion of missing data and false values within the variables of the cadastral register varies between 1-3%. The database the author created is applicable for the reliable and wide analysis of the current characteristics of the private forest sector of Hungary. The inactive entries in the cadastral register give opportunity to the analysis of processes in the past, but the older entries are more inaccurate. The entries registering the privatisation process are 17% inaccurate in some way. The entries of the land use form of the parcels are not applicable to monitor the forest area change in time on the parcel, and it is hard to track the ancestry of these parcel sub areas with different land use.

2. I proved with the help of Gini index that the private forest area shares among owners unequally. The Gini index is 0.85, which is 0.1 higher than the estimated Gini index of the inequality of the family forests in the

United States of America, and it is also high compared to other countries in the European Union, but less than the estimated Gini index of the Hungarian agricultural farms, which changed between 0.93-0.90 in the last 6 years. The Gini index of the forestry management units is 0.75.

The property structure of Hungarian private forest is fragmented in international relation. 100 000 owners have less than 500 square meters of forest land, and half of the owners have not more than 0.25 hectares.

The author found that 43% of the land parcels, 60% of forest subcompartments and 66% of the private forest area has at least two owners. In the case of the forest subcompartments this doesn't always mean joint ownership in the legislative way, but makes it obligatory for the owners to manage the area together.

As a conclusion, although the number of the owners is high, but because of the small size of their property or their small ownership ratio, a great group of the owners cannot make use of their forest property.

3. The forests of complexes which have only few hectares of forest area and lie on more land parcels, and because of it the number of owners needed for making decisions is higher, are more likely to be unmanaged, than forest of complexes with smaller forest area but less land parcels and owners.



It would be a solution for this problem if the forest area on a land parcel could be managed legally without the agreement of the owners of the neighbouring land parcels with overlapping forest subcompartment area.

4. I formed an index for the calculation of the geographical concentration of the forest properties called the Geographic Concentration of Property (GCP), which is similar to the Weighted Standard Distance index commonly used in spatial analysis. The index gives the radius of a circle in kilometres, which centre is the centre of gravity of the property, and the radius is the average distance of land parcels from the centre of gravity of the property weighed by their area.

The advantages of the GCP are that its value is unaffected by the area of the whole property and number of the land parcels forming the property. The index gives information about the distances between the parts of a property and how difficult it makes for the owner to use the forest property himself.

5. 65% of the Hungarian private forest owners have forest property only on one land parcel. I used the GCP to prove that 83% of the owners having forest property on more than one land parcels have concentrated property with GCP of 2.5 kilometres or less. The owners with geographically less concentrated property usually own forest area 8-10 times bigger than the average 1.8 hectares. This result disproves the belief

that the fragmented and dispersed forest property is common in the private forest sector.

Based on the database it also can be proved that 65% of the forest owners live within a 10 kilometres range of their forest property, so in most cases neither the distance from the property, nor the structure of the property would hinder the owner to be able to organise the management.

6. I disproved the earlier assumption, that the trade rate of forest land is very low, and doesn't have any significant effect on the property structure. Based on the analysis of the data base, the trade of forest land by purchase or as present between 01.01.2005 and 03.31.2016 affected 2.5% of the area per year, which is similar to the trade rate of agricultural land, and was enough to back-balance the effect of inheritance which increased the number of owners and affected 1.2% of the area per year in the given period.

A change of owner has occurred at least once on 75% of the area of private forest since they first became private property. The trade and inheritance of forest land demonstrably has changed the property structure since the privatisation, when it was less unequal than today. After 2000 four types of acquisition were dominant: purchase, inheritance, present and exchange. Inheritance affected yearly 10 000 hectares since 1998, and based on the age pyramid of the owners it is expectable to increase in the next decades. Purchase more frequently affect larger land

parcels (1-5 hectares of forest) than inheritance, and sums 15-20 000 hectares of forest land trade yearly.

7. Based on the cadastral register, on 03.30.2016 there were 453 000 natural persons owning forest land. I disproved the earlier paradigm that the number of forest owners is increasing continuously because of inheritance. I proved with two methods, that the number of owners has been decreasing since 2003 and the average size of property has grown from 1.52 to 1.75 hectares.

The inactive entries in the cadastral register make it possible to follow the change of the owners of land parcel in time. The high number of owners is the result of the methods used during the privatisation. The highest number of owners was 486 000 in 2003 and since then it has been decreasing despite the increasing of private forest land area due to afforestation. The reason is that in the case of forest land purchase, the buyer usually already owns forest, and frequently buys it from more owners at once so purchases decrease the number of owners by 7-8 000 per year, while inheritance only increases this number by 2-4 000 per year. If the area purchased will decrease for some reason and the area inherited will increase as predictable, the process can turn over, and the number of owners can start to increase.

8. Based on the cadastral data, there are two main phenomena forming the property structure of the

private forest sector in Hungary oppositely since the privatisation. The owners with 25 hectares of forest land or more purchase the forests of owners with middle sized properties (average of purchased area is 1,6 hectares) concentrating the private forest area. On the other hand, the less marketable forest properties, typically smaller than 1 hectare, usually fragmented further through inheritance (the number of owners increases by 7 in average after every 10 inheritance). The two opposing processes are increasing the inequality of the property structure further.

As a result of the process forest land gets concentrated in forest holding greater than 50-100 hectares, which is advantageous in point of view of management. On the other hand, the small properties get even more fragmented, making management even more complicated especially in the case of joint properties.

9. As the result of joining the two separate databases and the analysis of the data I made a database and created a methodology, which is applicable for further studies on the private forest sector, and after refreshing the database with up to date tables from the two registries it is possible to analyse events happened in the sector after this study.

### **The relevance of the result in practice**

The database used for the study is applicable in further analysis of the sector, for example the effect of forest stand parameters on the trade of forest land.

The introduced processes and information can be used by policymakers when changing the legislation of the sector. The purchases play a significant role in the sector, and if a legislative change makes it easier or harder to buy forest, it can have a noticeable effect on the ownership structure of the private forests. The problem of fragmentation through inheritance can only be handled by legislative methods.

The methodology used in this study can be used in the future to monitor the effect of legislative changes or subsidies aiming to change the property structure if the database is refreshed with up to date data.

## **Publication**

### **Publications in magazines, conference volumes**

Mertl, T. and Schiberna, E. 2018: Magyarországi magán-erdőtulajdonosok (Private forest owners in Hungary), Erdészettudományi közlemények 8 : 2, 113-126. pp.

László, D.; Lett, B.; Mertl, T.; Schiberna, E. and Stark M. 2017: Erdészeti őstermelők a magán erdőgazdálkodásban (Forestry primary producers in the private forest sector), Őstermelő: gazdálkodók lapja 21 : 4, 50-54. pp.

Mertl, T. and Schiberna, E. 2017: A magyarországi magántulajdonú erdők tulajdonszerkezete (Property structure of private forests in Hungary), Erdészettudományi közlemények 7 : 1, 7-23. pp.

Mertl, T and Schiberna, E. 2016: A magyar magánerdők birtokszerkezeti jellemzőinek vizsgálata ingatlan-nyilvántartási adatok segítségével (Analysis of the property structure of Hungarian private forest based on data from the cadastral register), 1st. Conference of the Programme aiding researcher supply, Publications, 27-31. o., National Agricultural Research and Innovation Centre, Gödöllő 2016

Schiberna, E. and Mertl, T 2016: A magán-erdőgazdálkodás fejlődésének elemzése (The analysis of the development of private forest sector), The Economy Department of NAIK ERTI is 50 years old, jubilee conference volume, Sopron 2015.

Schiberna, E. and Mertl, T. 2015: A magántulajdonú, erdő művelési ágú földrészek jellemzői (The parameters of privately owned land parcels with forest land use form), In: Lett, B; Schiberna, E; Jáger, L; Stark, M; Horváth, S (ed.) Studyvolume in tribute to Károly Mészáros 2015, Sopron, Hungary: Nyugat-magyarországi Egyetem Kiadó, 202. p.

### **Presentations**

Mertl, T. 2016: Érdekességek a magán-erdőtulajdonosokról (Interesting facts about private forest owners), Session of Chamber of Agriculture, Miskolc, 2016.06.14.

Mertl, T. and Schiberna, E. 2016: A magyar magánerdők birtokszerkezeti jellemzőinek vizsgálata ingatlan-nyilvántartási adatok segítségével (Analysis of the property structure of Hungarian private forest based on data from the cadastral register), 1st. Conference of the Programme aiding researcher supply, Gödöllő, 2016.03.03-04.

Schiberna, E. and Mertl, T 2015: A magán-erdőgazdálkodás fejlődésének elemzése (The analysis of the development of private forest sector), The Economy Department of NAIK ERTI is 50 years old, jubilee conference, Sopron 2015.06.04.